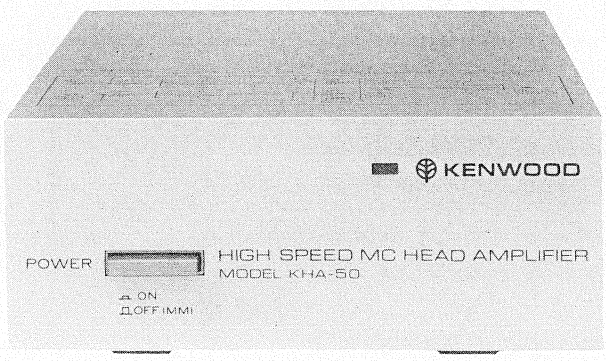
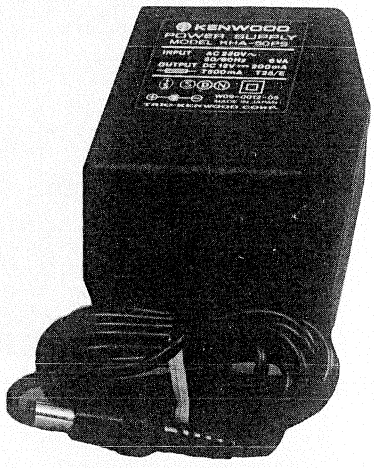
KENWOOD

HI/FI STEREO COMPONENTS

SERVICE MANUAL

KHA-50

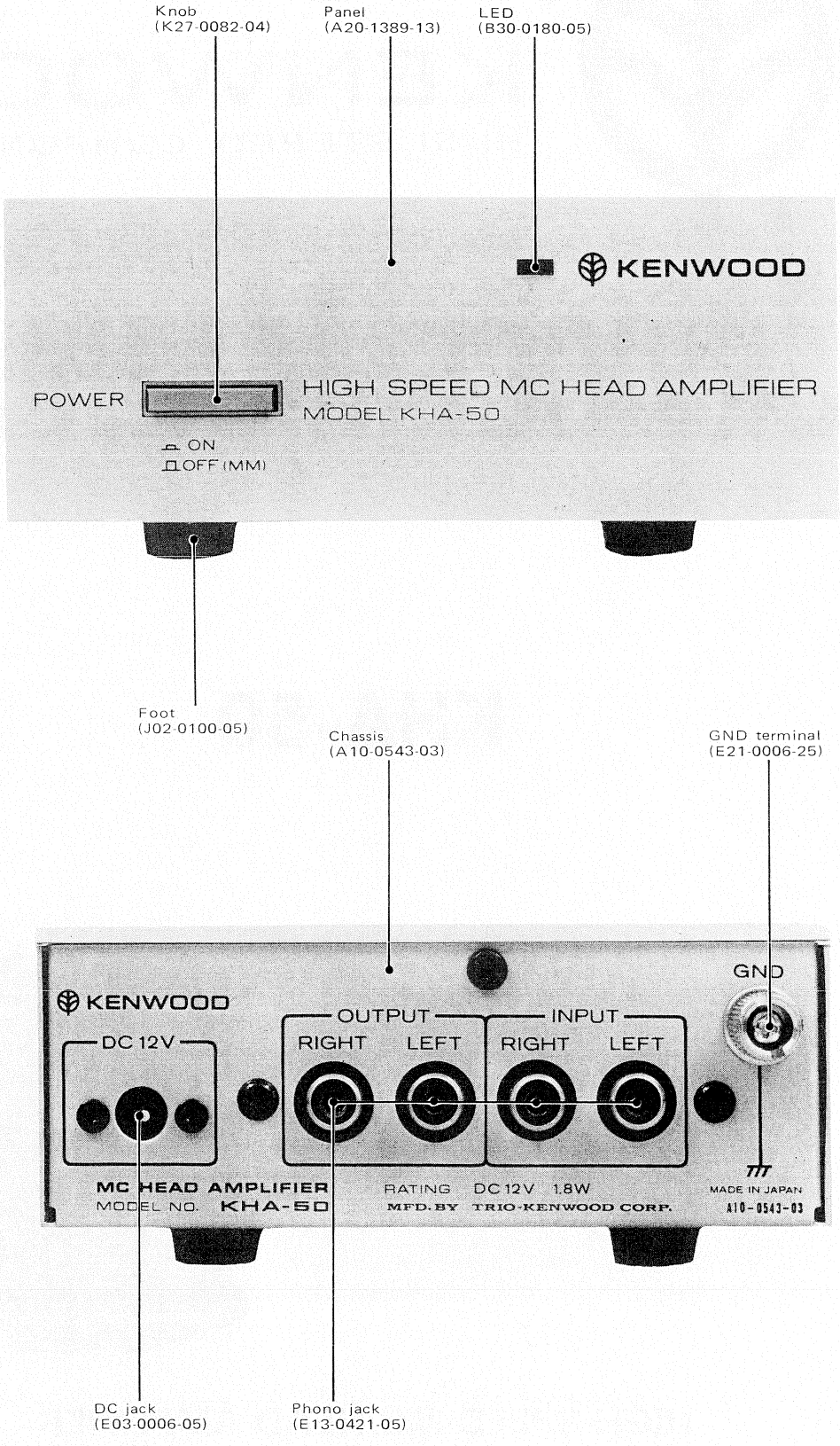




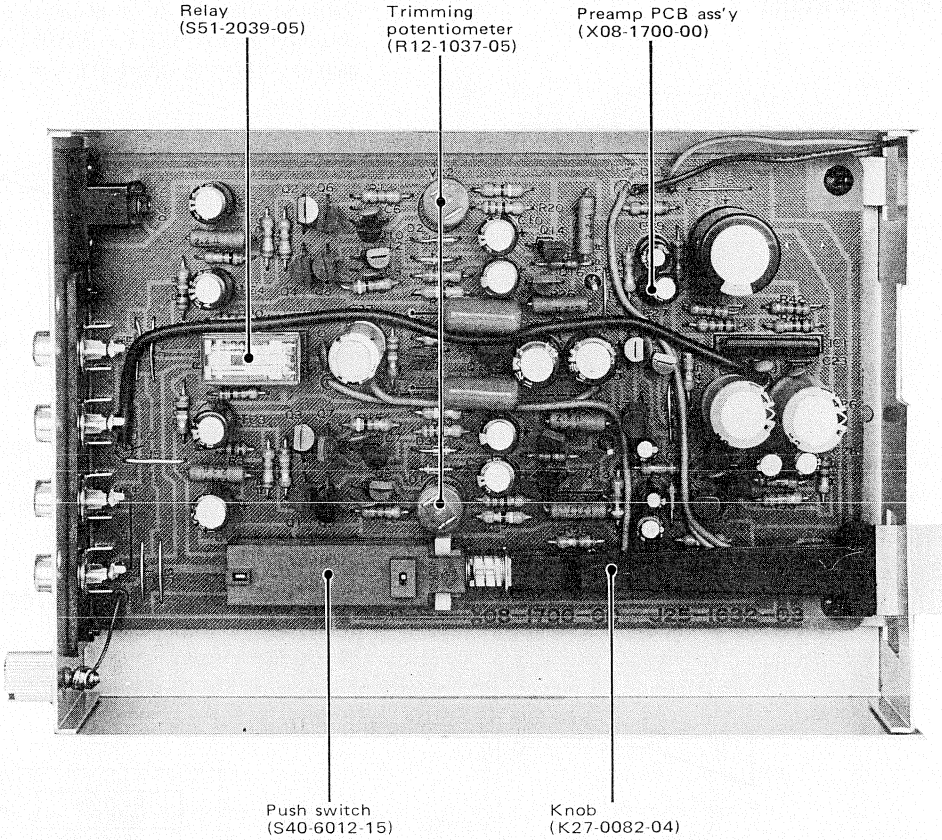
HIGH SPEED MC HEAD AMPLIFIER

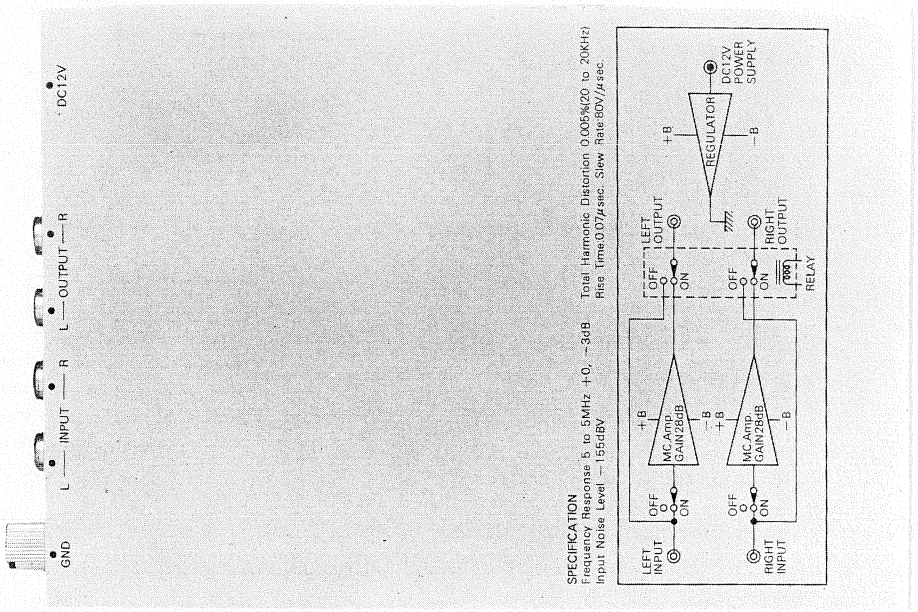
KHA-50

EXTERNAL VIEW



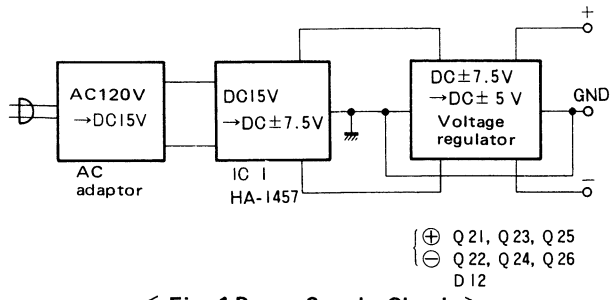
INTERNAL VIEW





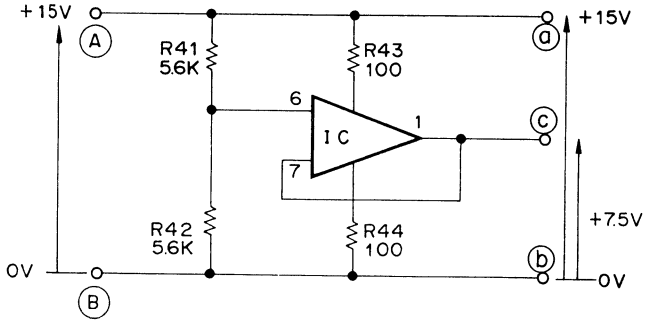
CIRCUIT DESCRIPTION

POWER SUPPLY CIRCUIT

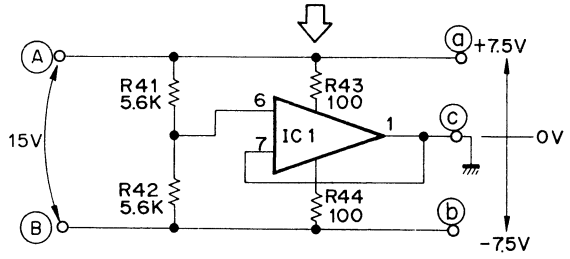


< Fig. 1 Power Supply Circuit >

The IC (HA-1457) is a low noise differential amplifier to make positive and negative power voltages. This IC is normally used in equalizer circuits.



< Fig. 2-a >

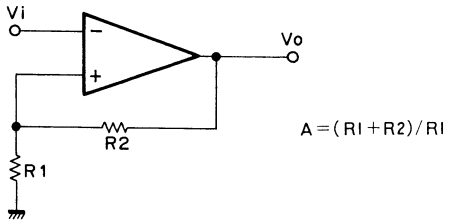


< Fig. 2-b >

Referring to Fig. 2-a, when the point Ⓑ is grounded, a voltage of +15 V is fed at the point Ⓐ and a voltage of +7.5V, a half of 15 V, at the pin 6. Being of a differential type, this IC provides the same voltage to the pin 6 and pin 7. Since the pin 7 is directly connected to the pin 1, the voltage at the pin 1 is also the same.

Consequently, the output voltage at the pin 1 is the same as the voltage (7.5 V) at the pin 6. When the point ⓑ on the output side is grounded, the point ⓐ is given +15 V and the point ⓒ +7.5 V.

Suppose that the IC is an amplifier having a gain of "1", then the gain A = (R1 + R2)/R1 as shown in Fig. 3. This gain is 1 (A = 1) where R1 = ∞ and R2 = 0.

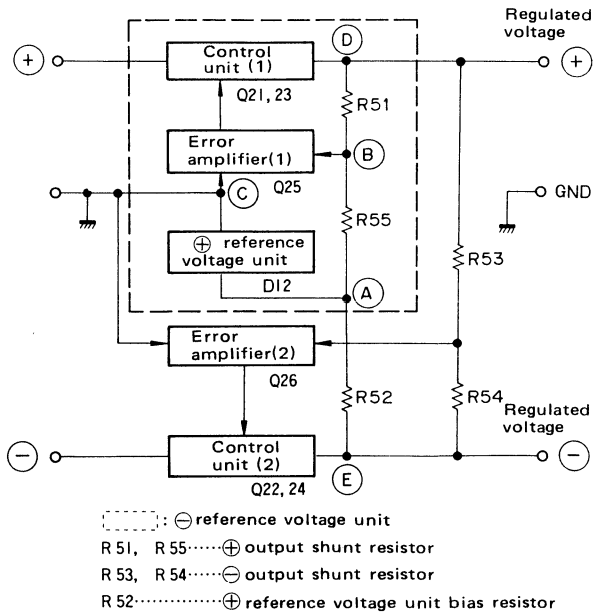


< Fig. 3 >

The outputs at the point ⓐ and point ⓑ are +7.5 V and −7.5 V respectively with regard to the point ⓒ as shown in Fig. 2-b. Note that the point Ⓑ on the input side is not grounded.

POWER VOLTAGE REGULATOR

The power voltage regulator used in the KHA-50 is composed of a reference voltage unit, error amplifier and control unit.



< Fig. 4 >

As will be understood from Fig. 4, the ⊕ voltage is first regulated, then the ⊖ voltage using the regulated ⊕ voltage as a reference. The ⊕ reference voltage (5 V) is applied to between the points Ⓐ and Ⓒ through the zener diode, D12. The error amplifier (1) is of NPN type, so a voltage (0.6 V) is present between the points Ⓒ and Ⓑ, thereby applying the voltage (about 5.6 V) to between the

CIRCUIT DESCRIPTION

points Ⓐ and Ⓑ.
As the current in R55 is equal to that in R51, the voltage between the points Ⓐ and Ⓓ is:

$V_{ⒶⒹ} = V_{ⒶⒷ} \times (R51 + R55)/R55$
$\fallingdotseq 10.7\ V$

Therefore, the output voltage $V_{ⒸⒹ}$ is:

$V_{ⒸⒹ} = V_{ⒶⒹ} - V_{ⒶⒸ} \fallingdotseq 5.1\ V$

The ⊖ voltage can be obtained in the same manner (reference voltage: $V_{ⒸⒹ}$). The output voltage $V_{ⒸⒺ}$ is:

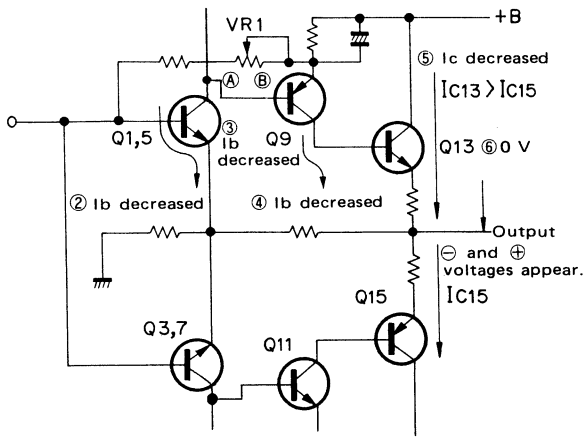
$V_{ⒸⒺ} \fallingdotseq -5.0\ V$

The control units (1 and 2) are of the Darlington connection. The ripple filter composed of C25-30, C33 and C34 is used to minimize the noise in the circuit.
Although the variation in the ⊖, power supply voltage has no effects on the ⊕ voltage, the variation in the ⊕, voltage affects the ⊖ output voltage.

ADJUSTMENT

OFFSET ADJUSTMENT AND FUNCTIONS

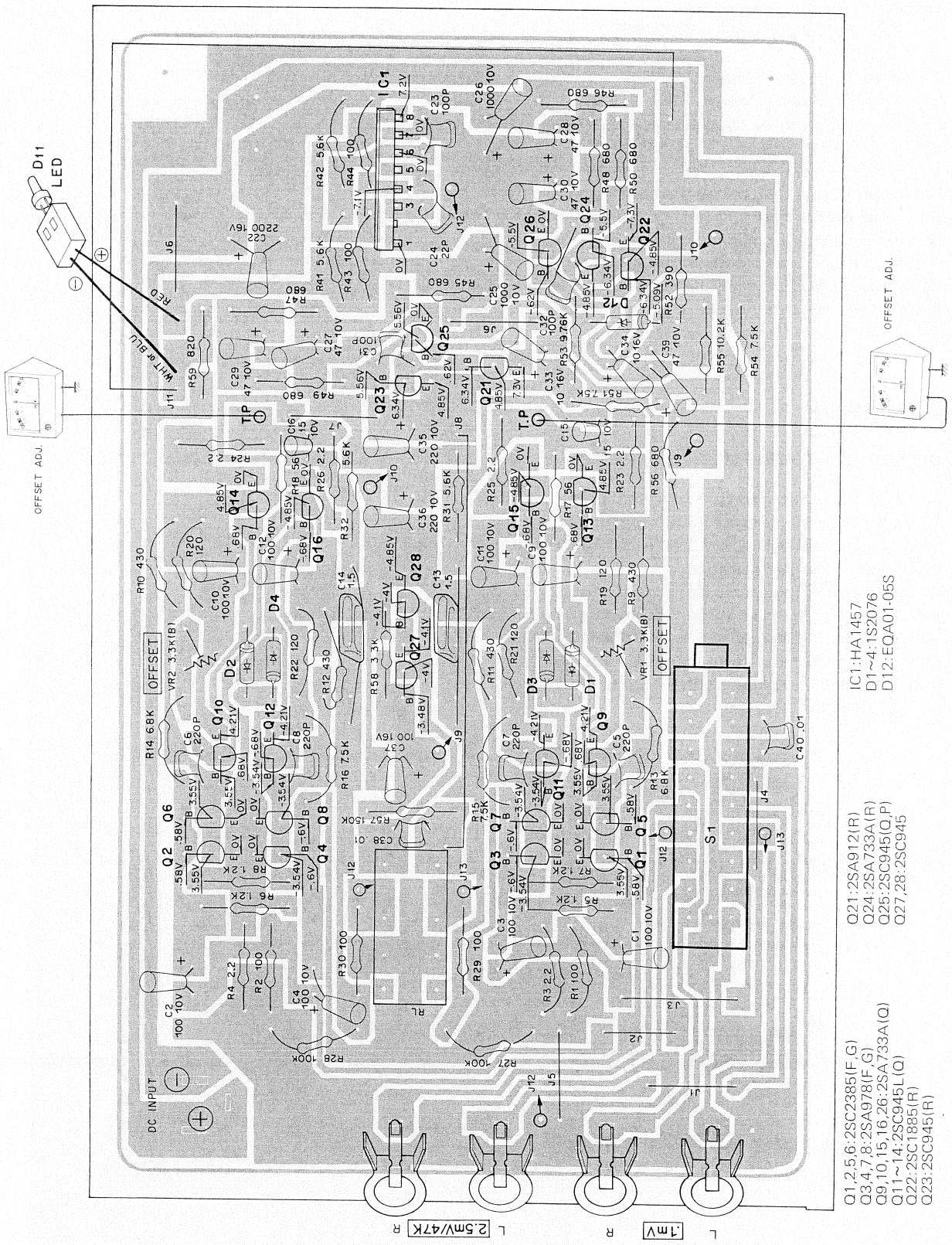
To adjust the offset, connect a voltmeter to the test point, TP on the preamplifier circuit board, then adjust the trimming potentiometers VR1 and 2 (3.3 kΩ) for DC 0 V (see the diagram on printed circuit board).
When a positive voltage is present on TP, Ic13 is greater than Ic15. To reduce Ic13, turn VR1 in the Ⓑ direction. This increases the bias resistances of Q1 and Q5 which, in turn, reduces the base current to a large extent. In contrast with this, when a negative voltage is present, turn VR1 in the Ⓐ direction



< Fig. 5 ⊕ Voltage on Output Terminal >

PC BOARD

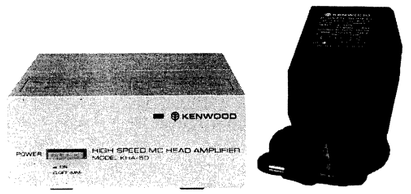
Components Side



KENWOOD

HIGH SPEED MC HEAD AMPLIFIER

KHA-50



SPECIFICATIONS

Input Sensitivity and Impedance
PHONO (MC) . . . . . 0.1 mV, 100 ohms
Output Level and Impedance
Rated Output . . . . . 2.5 mV at 100 ohms
Maximum Output . . . . . 1.5 V
Frequency Response
. . . . . From 5 Hz to 2 MHz, +0 dB, –3 dB
Total Harmonic Distortion
. . . . . 0.005% at Maximum Output from 20 Hz to 20 kHz
Signal to Noise Ratio (IHF-A)
. . . . . .75 dB at rated output
Equivalent Input Noise Level (IHF-A)
. . . . . –155 dBV
Maximum Input Level for PHONO (MC)
. . . . . 60 mV (RMS), T.H.D. 0.005% at 1 kHz
Transient Response
Rise Time..0.12 μs (less than 2 V peak to peak)
Slew Rate ... . ±40 V/μs
Power Supply (AC Adaptor)
(For U.S.A.)
Model 28A-4105
Input . . . . . AC 120 V, 60 Hz 5 W
Output . . . . . DC 12 V, 200 mA
(For Europe)
Model KHA-50PS
Input . . . . . AC 220 V∿, 50/60 Hz 6 VA
Output. . . . . DC 12 V ⎓ 200 mA
Protector . . . . . T500 mA
Supplied Accessory . . . . . 1 Connecting Cord

Note:
Kenwood follows a policy of continuous advancements in development. For this reason specifications may be changed without notice.

Q1,2,5,6	: 2SC2385(F,G)	Q25	: 2SC945(Q,P)
Q3,4,7,8	: 2SA978(F,G)	Q27,28	: 2SC945
Q9,10,15,16,26	: 2SA733A(Q)	IC1	: HA1457
Q11~14	: 2SC945L(Q)	D1~4	: 1S2076
Q21	: 2SA912(R)	D12	: EQA01-05S
Q22	: 2SC1885(R)		
Q23	: 2SC945(R)		
Q24	: 2SA733A(R)		

KHA-50

2SA978 2SC2385 | 2SA733A 2SA912 2SC945 2SC1885 | HA-1457

DC voltage measured with 20 kΩ/V VOM under no signal.

PARTS LIST

☆ : new parts

Ref. No.	Parts No.	Description		Re-marks
TOTAL				
—	A10-0543-03	Chassis		☆
—	A20-1389-13	Panel		☆
—	B07-0253-04	Escutcheon		☆
D11	B30-0180-05	LED (green)		☆
—	B42-0009-04	Passed sticker		
—	B42-0473-24	Serial No. sticker		
—	B46-0055-20	Warranty card	P	
—	B46-0061-20	Warranty card	K	
—	B50-1828-00	Instruction manual	K, E	☆
—	B50-1829-00	Instruction manual	P	☆
—	E21-0006-25	GND terminal		
—	E30-0606-05	Audio cord		☆
—	H01-1856-03	Carton box	K, E	☆
—	H01-1900-03	Carton box	P	☆
—	J02-0100-05	Foot		☆
—	J19-0534-04	LED holder		☆
—	K27-0082-04	Knob		
—	W09-0011-05	AC adaptor	K, P	☆
—	W09-0012-05	AC adaptor	E	☆
—	X08-1700-00	Preamp PCB ass'y		☆
PREAMP PCB ASS'Y (X08-1700-00)				
C1~4	C24-1010-71	Electrolytic 100μF 10WV		
C5~8	C71-1722-15	Ceramic 220pF ±5%		
C9~12	C24-1010-71	Electrolytic 100μF 10WV		
C13,14	C91-0068-05	Film 1.5μF 100WV		
C15,16	C26-1015-67	Non-pole electrolytic 15μF 10WV		
C22	C90-0390-05	Electrolytic 2200μF 16WV		☆
C23	C71-1710-15	Ceramic 100pF ±5%		
C24	C71-1722-05	Ceramic 22pF ±5%		
C25,26	C24-1010-81	Electrolytic 1000μF 10WV		
C27~30	C24-1047-61	Electrolytic 47μF 10WV		
C31,32	C71-1710-15	Ceramic 100pF ±5%		
C33,34	C24-1210-61	Electrolytic 10μF 16WV		
C35,36	C24-1022-71	Electrolytic 220μF 10WV		
C37	C25-1210-77	Electrolytic 100μF 16WV		
C38	C55-1710-38	Ceramic 0.01μF +100%,−0%		
C39	C24-1047-61	Electrolytic 47μF 10WV		
C40	C55-1710-38	Ceramic 0.01μF +100%,−0%		
—	E03-0006-05	DC jack		
—	E13-0421-05	Phono jack (gold-plated)		
VR1,2	R12-1037-05	Trimming potentiometer 3.3kΩ(B) Offset		
R17,18	R48-6256-05	RN 56Ω ±5% 1/4W		
R53	R48-2976-14	RN 9.76kΩ ±2% 1/4W		
R55	R48-2102-24	RN 10.2kΩ ±2% 1/4W		
S1	S40-6012-15	Pushbutton switch		☆
RL	S51-2039-05	Relay		☆
Q1,2	V03-2385-10	Transistor 2SC2385(F,G)		
Q3,4	V01-0978-10	Transistor 2SA978(F,G)		
Q5,6	V03-2385-10	Transistor 2SC2385(F,G)		
Q7,8	V01-0978-10	Transistor 2SA978(F,G)		
Q9,10	V01-0733-50	Transistor 2SA733A(Q)		
Q11~14	V03-0945-50	Transistor 2SC945(L)(Q)		
Q15,16	V01-0733-50	Transistor 2SA733A(Q)		
Q21	V01-0912-30	Transistor 2SA912(R)		
Q22	V03-1885-20	Transistor 2SC1885(R)		
Q23	V03-0316-05	Transistor 2SC945(R)		
Q24	V01-0733-70	Transistor 2SA733A(R)		
Q25	V03-0348-05	Transistor 2SC945(Q,P)		
Q26	V01-0733-50	Transistor 2SA733A(Q)		
Q27,28	V03-0297-05	Transistor 2SC945		
D1~4	V11-0271-05	Diode 1S2076		
D12	V11-0462-05	Zener diode EQA01-05(S)		
IC1	V30-0264-10	IC HA1457		

KHA-50

SEMICONDUCTOR SUBSTITUTIONS

Semiconductor Name	Semiconductor Substitutions
2SA733A(Q,P)	2SA872(D), 2SA899(B,G), 2SA915(K,L,M), 2SA992(P), 2SA921(R)
2SA733A(R)	2SA915(M), 2SA899(B,G)
2SA912(R)	2SA921(R), 2SA915(L,M), 2SA899(B,G)
2SA978(F,G)	—
2SC945(Q,P)	2SC1845(P), 2SC1980(R), 2SC1940(K,L,M), 2SC1904(B)
2SC945(R)	2SC1904(B,G), 2SC1940(M)
2SC1885(R)	2SC1980(R), 2SC1940(M), 2SC1904(B)
2SC2385(F,G)	—

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